LAB #3: Processing of Single Beam Echosounding Data

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Course Code: ESSE 4650

Introduction

This lab tasks students to use the CARIS HIPS and SIPS program to complete following tasks. Things such as vessel dimension creation, processing survey lines, and analyzing sound velocity profiles. The ArcGIS program was used for the last task to process parameters for survey lines.

Methodology and Discussion

DELIVERABLE 1:

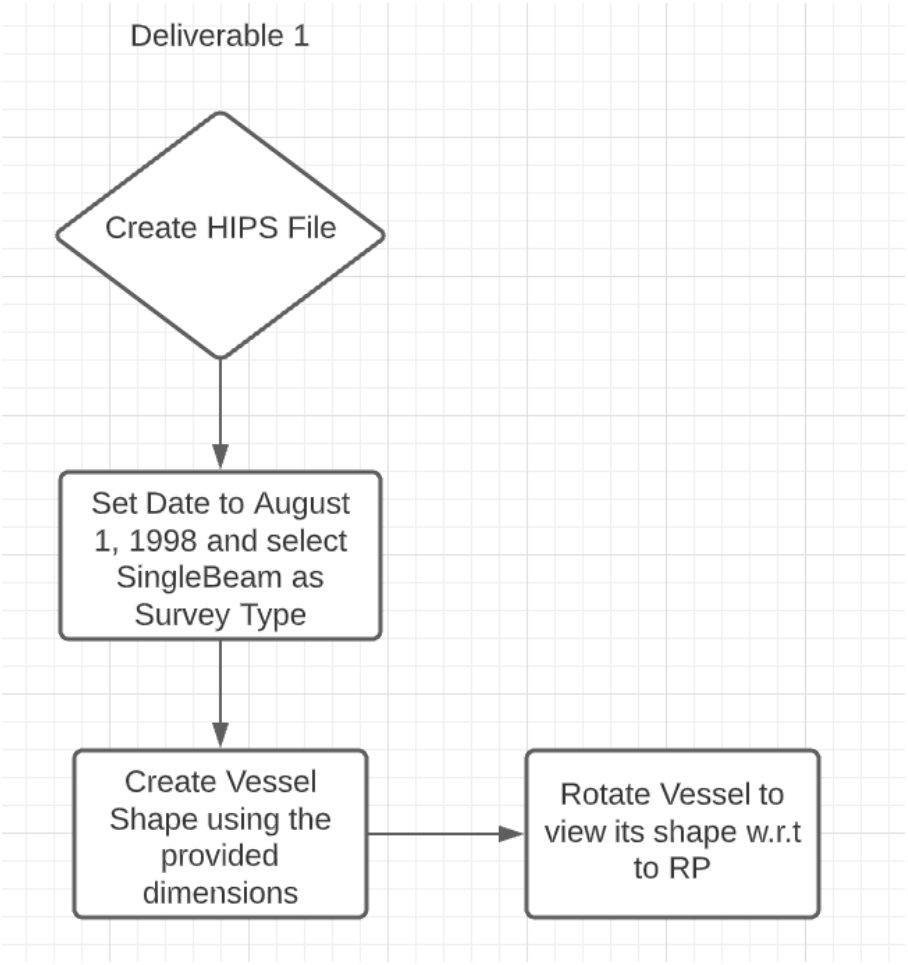
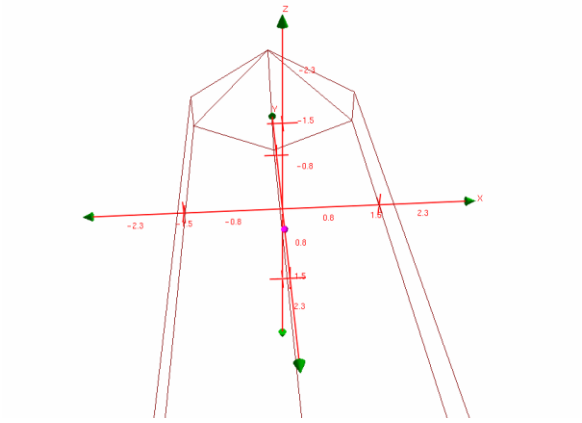
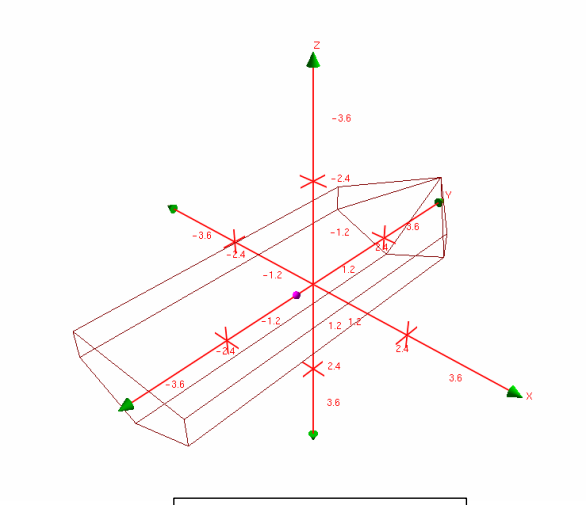


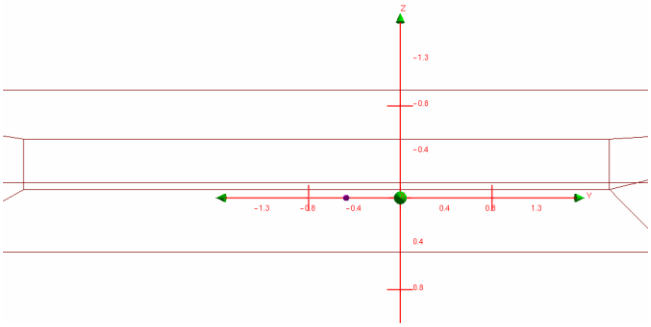
Figure 1: Deliverable 1 Workflow



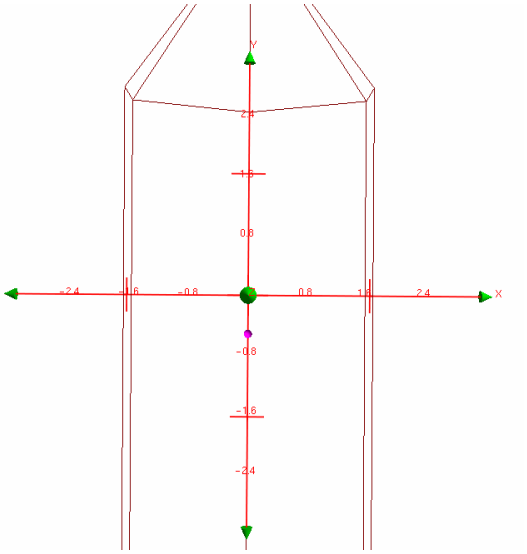
Width of 3m



Angle from 3D Plane



RP is approximately 0.5 m from the Keel



RP is approximately in the middle of the 3m beam

Figure 2: Images of Vessel Shape w.r.t Reference Point (Purple Point)

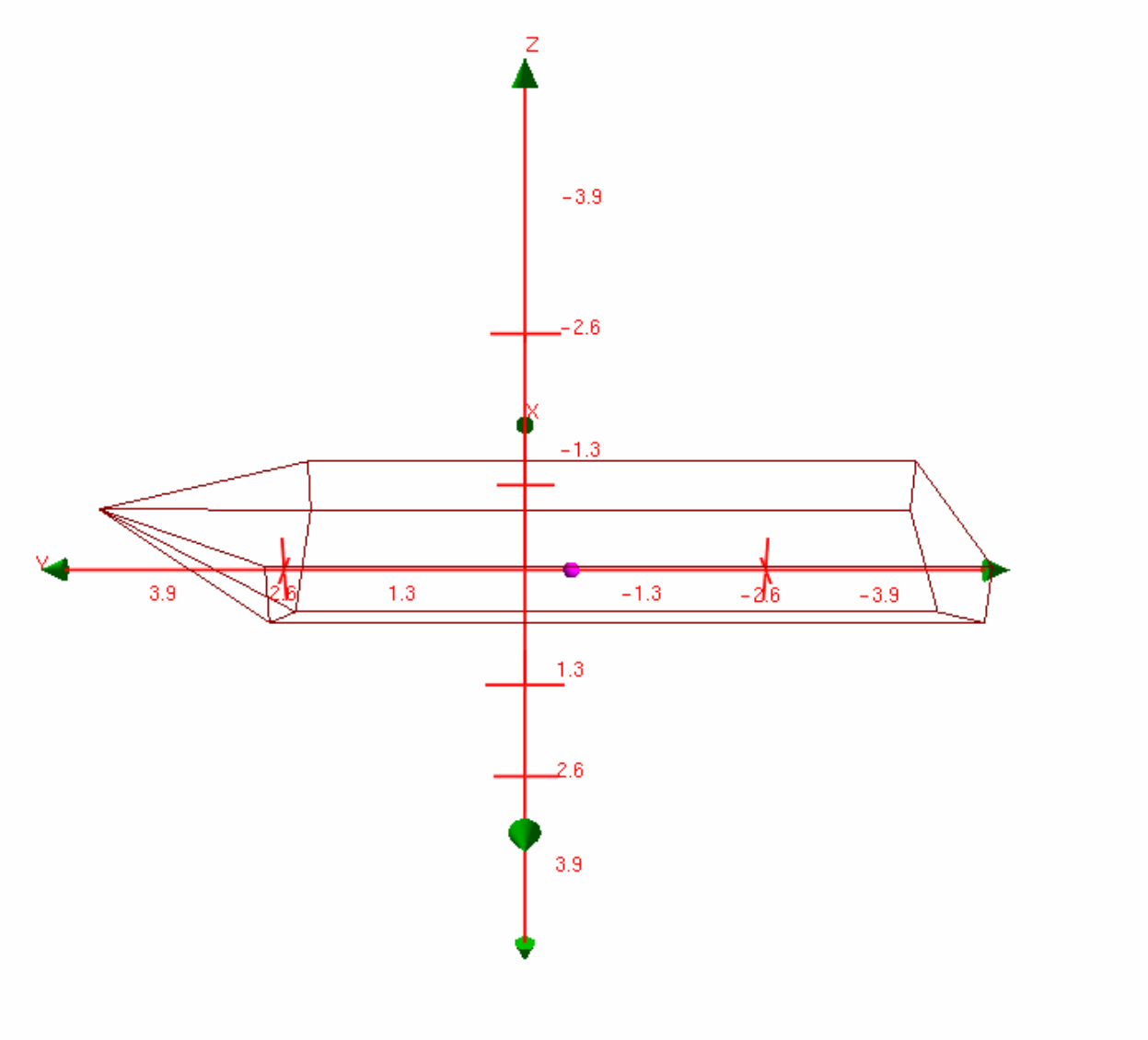


Figure 3: Plan View of Vessel Shape

This 4m from the RP to the stern is a little questionable as the RP is not at the origin of the axis and the length of the Y axis arrow shows that the back of the stern to the origin is 4m. The image shows that the RP to the stern is a little less than 4m.

We can see the dimensions of the vessel aligned to the grid created. Looking at the figures, there is an interception or an “x” shape on the grid to show what the length is at that interception.

Deliverable 2

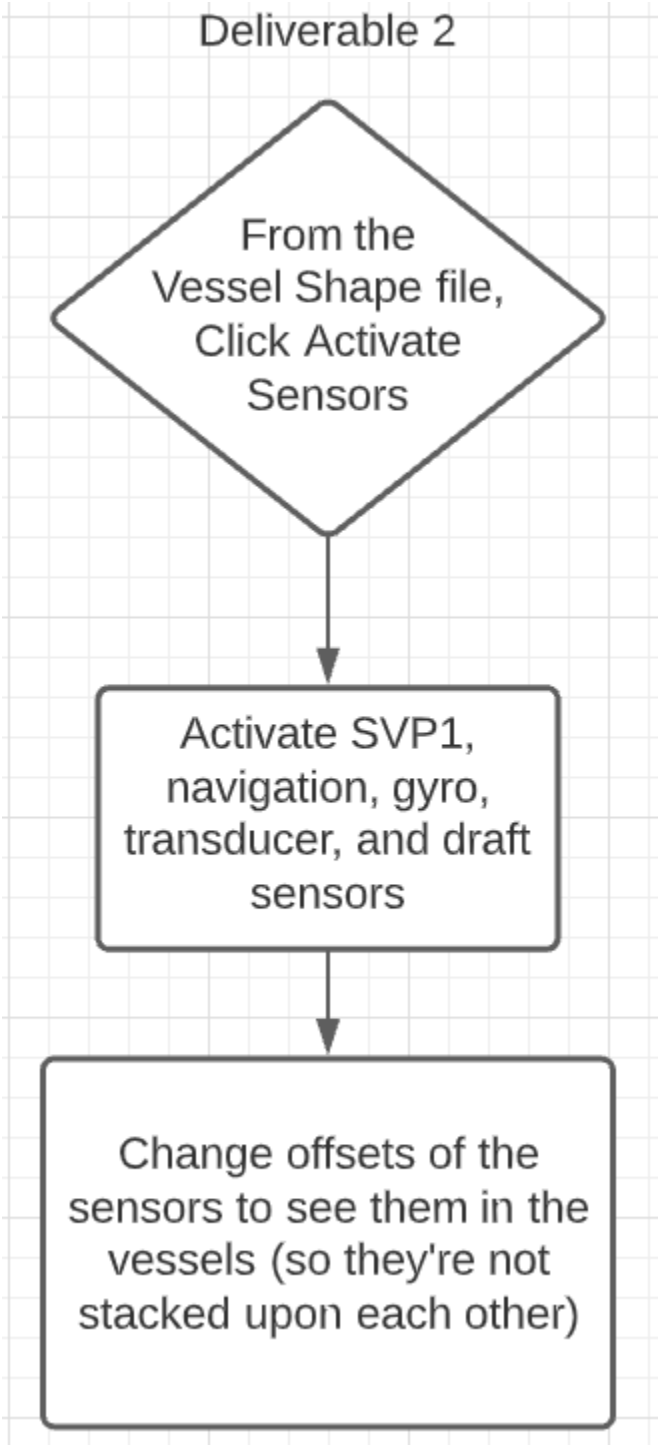


Figure 4: Deliverable 2 Workflow

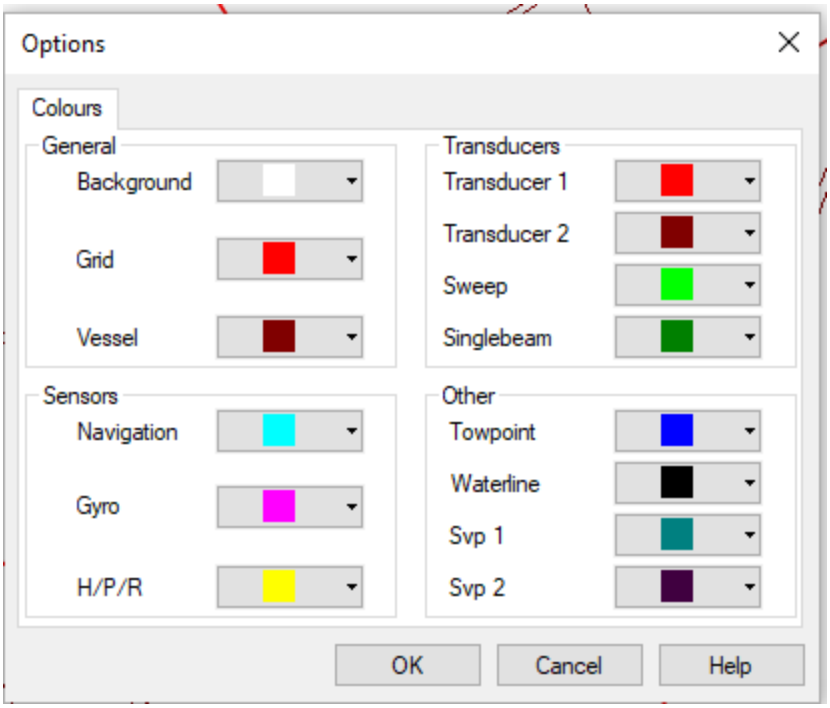


Figure 5: Sensor Colour Legend

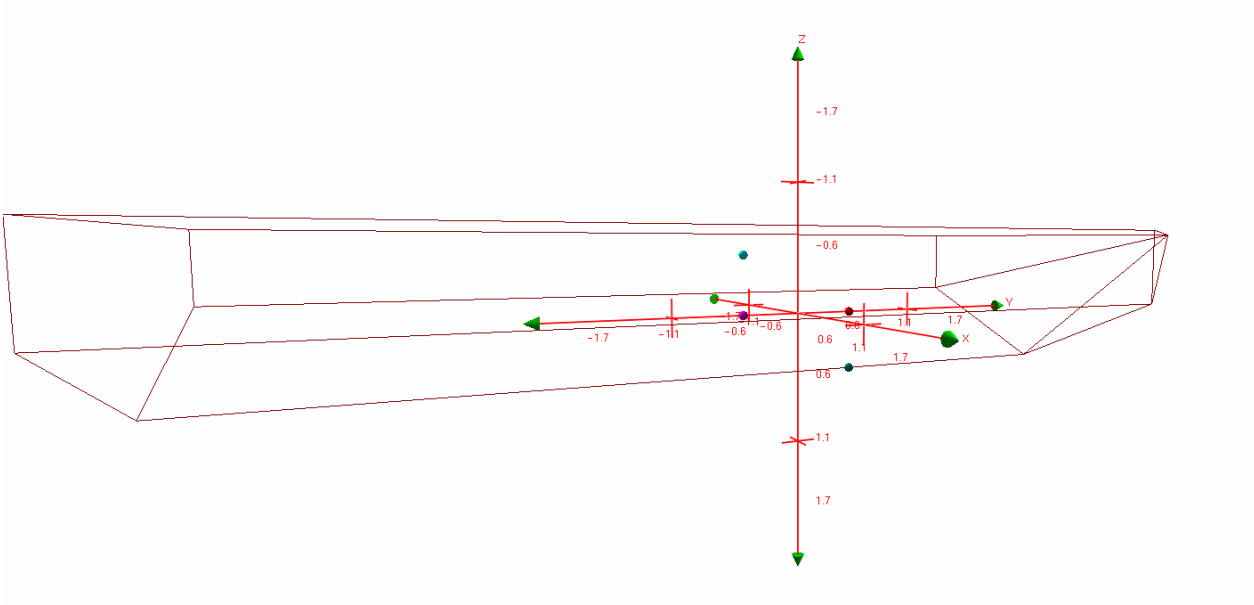


Figure 6: Location of the Sensors in the Vessel

SVP1 is bottom most point, transducer point is above SVP1, Gyro point is on the same plane as Transducer point, and Navigation is above the Gyro point

Deliverable 3

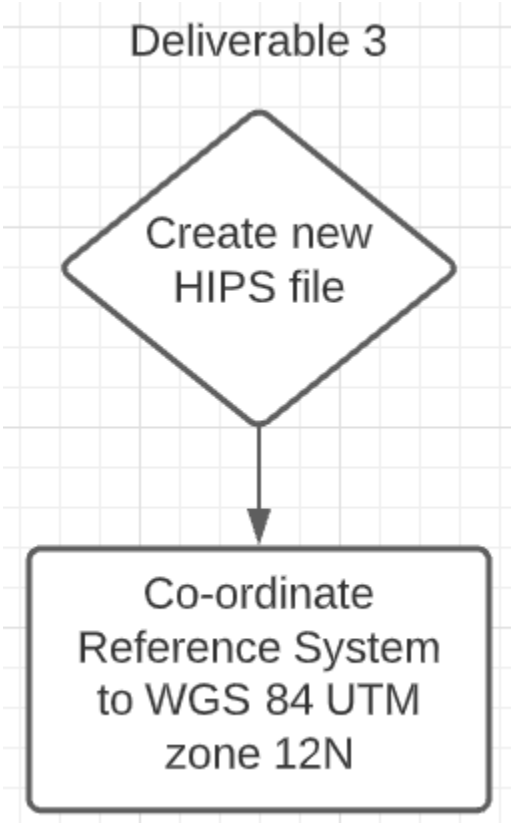


Figure 7: Deliverable 3 Workflow

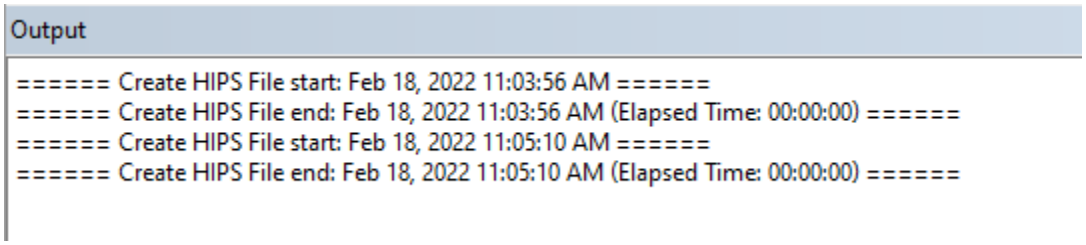


Figure 8: Output Window showing the Creation of the HIPS file

HIPS file created at 11:05 AM is the one with the correct co-ordinate system [WGS 84 UTM zone 12N]

Deliverable 4

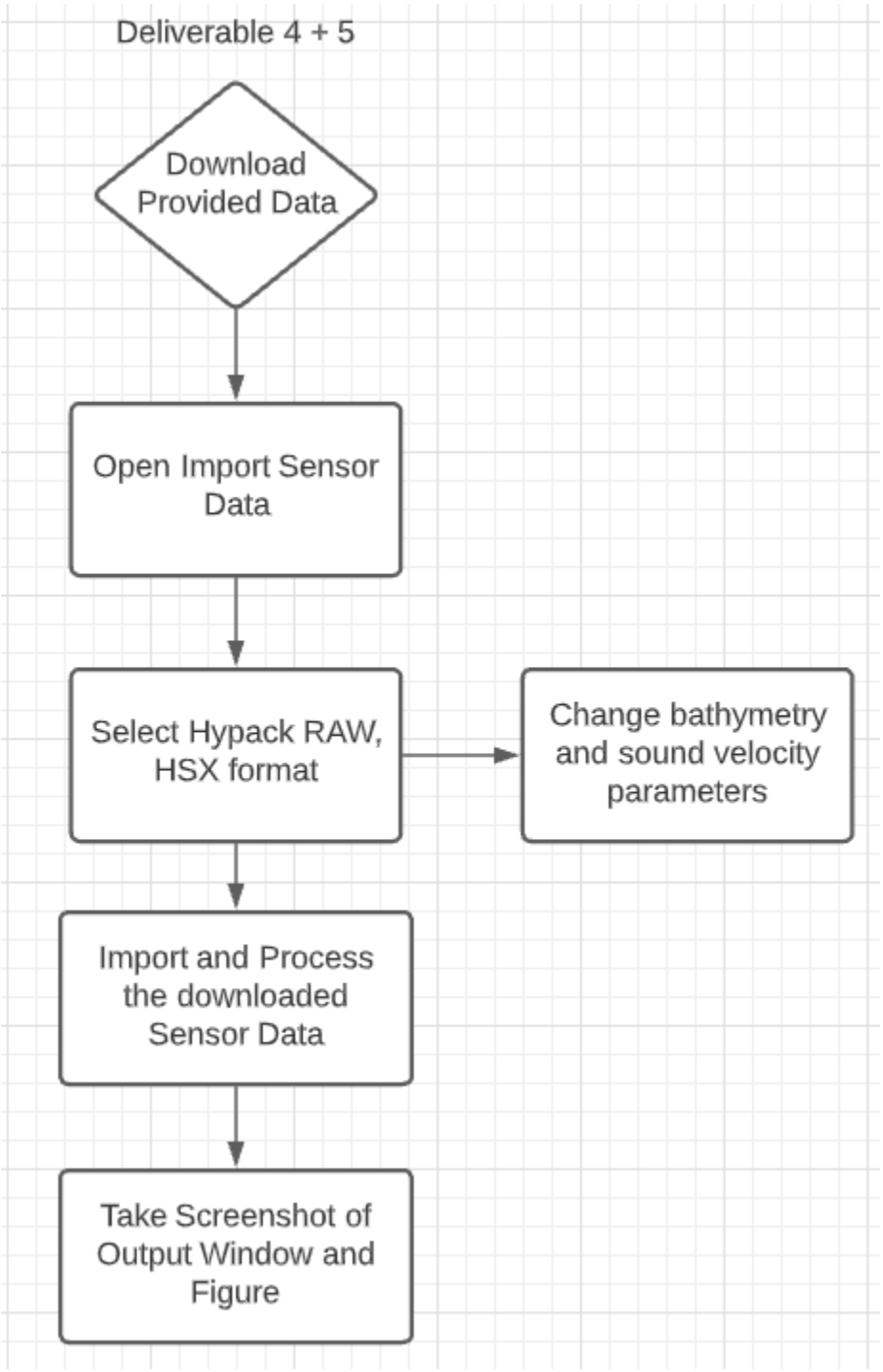


Figure 9: Deliverable 4 + 5 Workflow

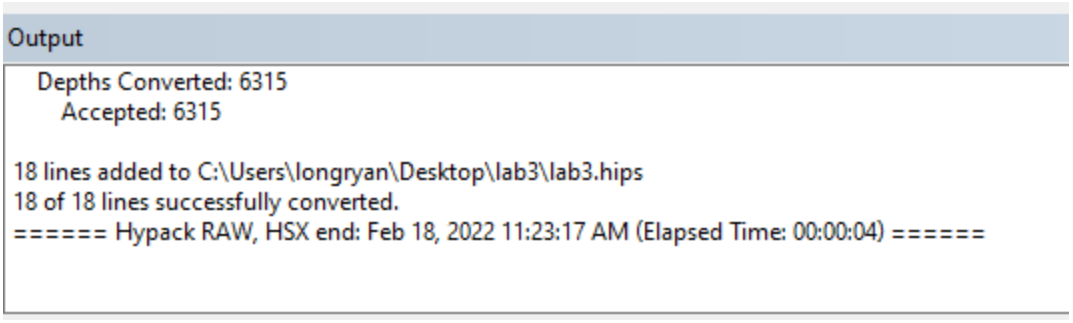


Figure 10: Output Window of the 18 Survey Lines

18 Survey lines have been read in.

Deliverable 5

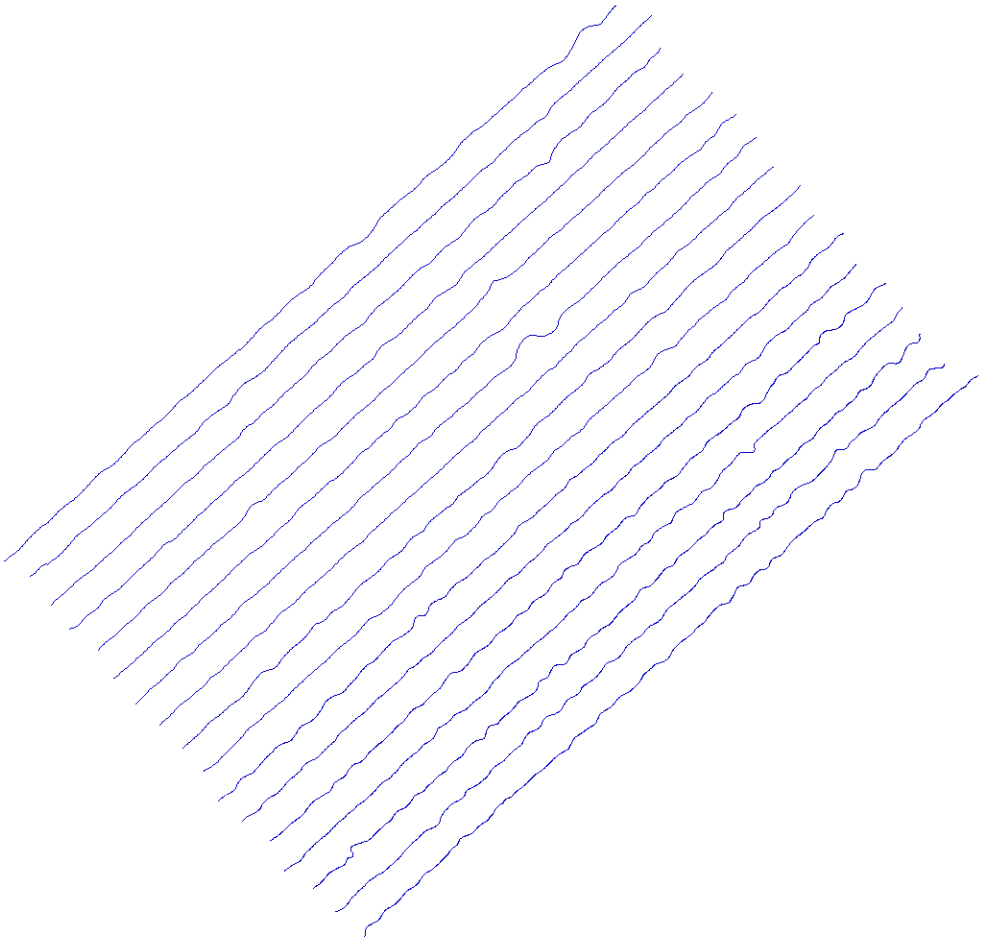


Figure 11: Figure of the 18 Survey Lines

Deliverable 6

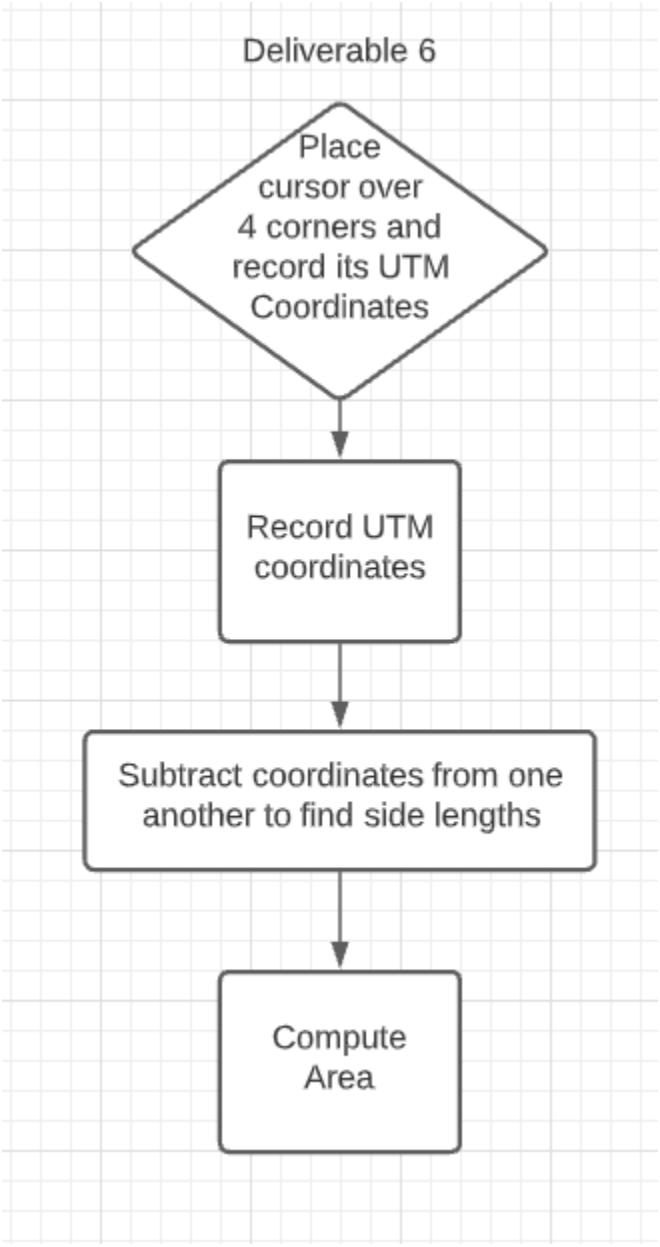


Figure 12: Deliverable 6 Workflow

We can use the area of a rectangle equation as the survey lines depict that shape and divide by 1 million to convert the area to kilometers squared. We will also break this up using a figure I will create to find the total area.

Equation 1: Area of a Rectangle

$$A = \frac{wl}{1000 * 1000}$$

Equation 2: Area of a Triangle

$$A = \frac{wl}{2 * 1000 * 1000}$$

Table 1: UTM Coordinates of the Geographical Coverage

Corner	UTM Coordinate (m)
North	(579417.59, 7582294.91)
East	(581640.95, 7580011.94)
South	(577843.95, 7576524.90)
West	(575608.66, 7578855.55)

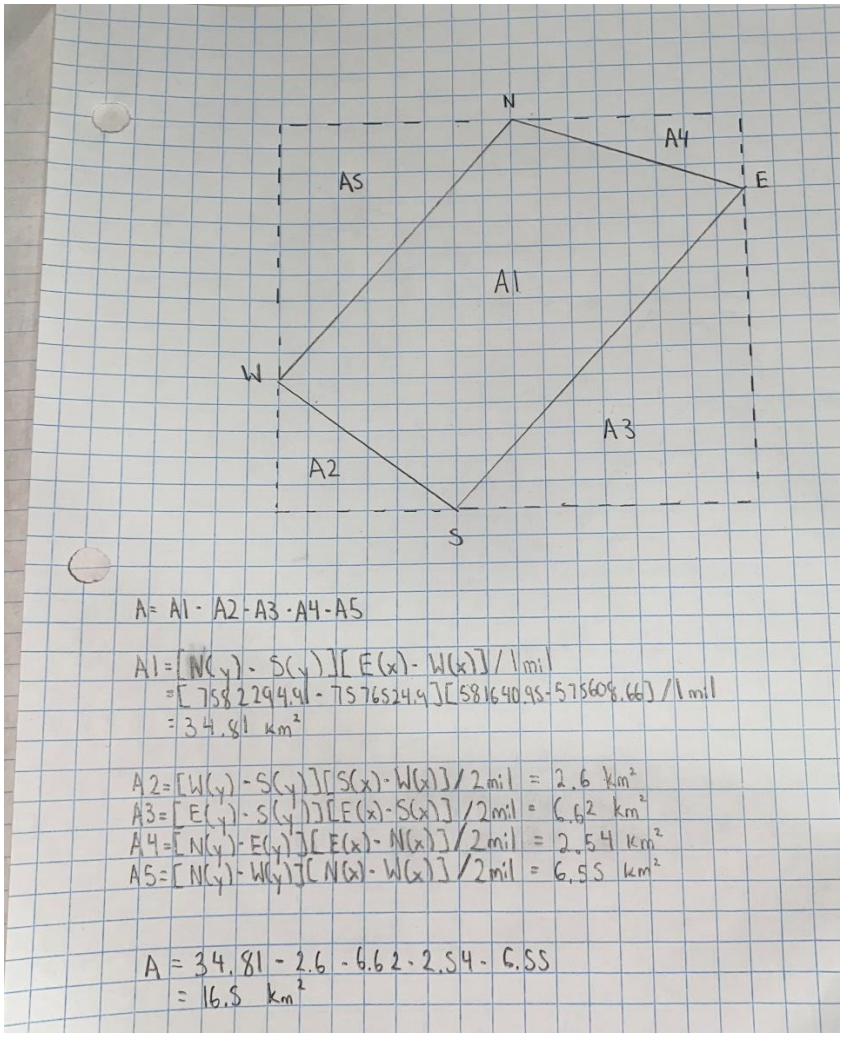


Figure 13: Computation of Area

The area of the coverage is 16.5 km^2.

Deliverable 7 and 8

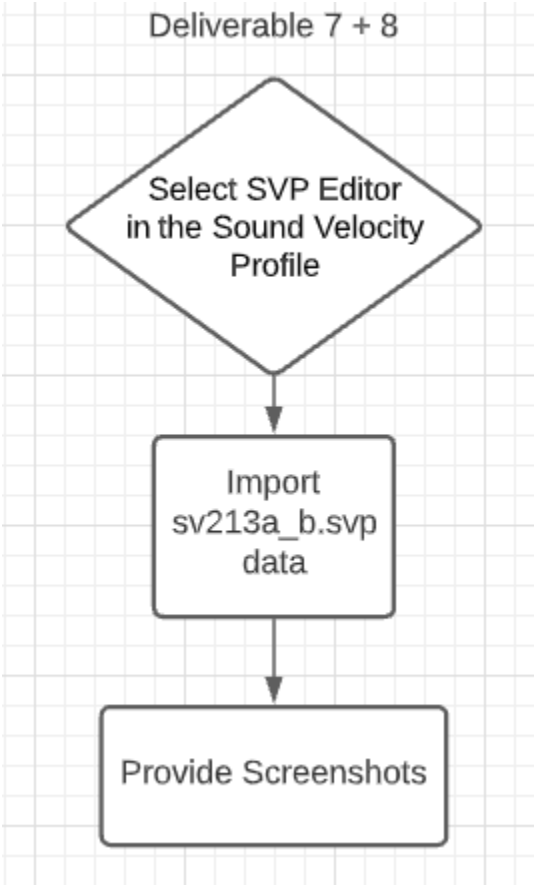


Figure 14: Deliverable 7 + 8 Workflow

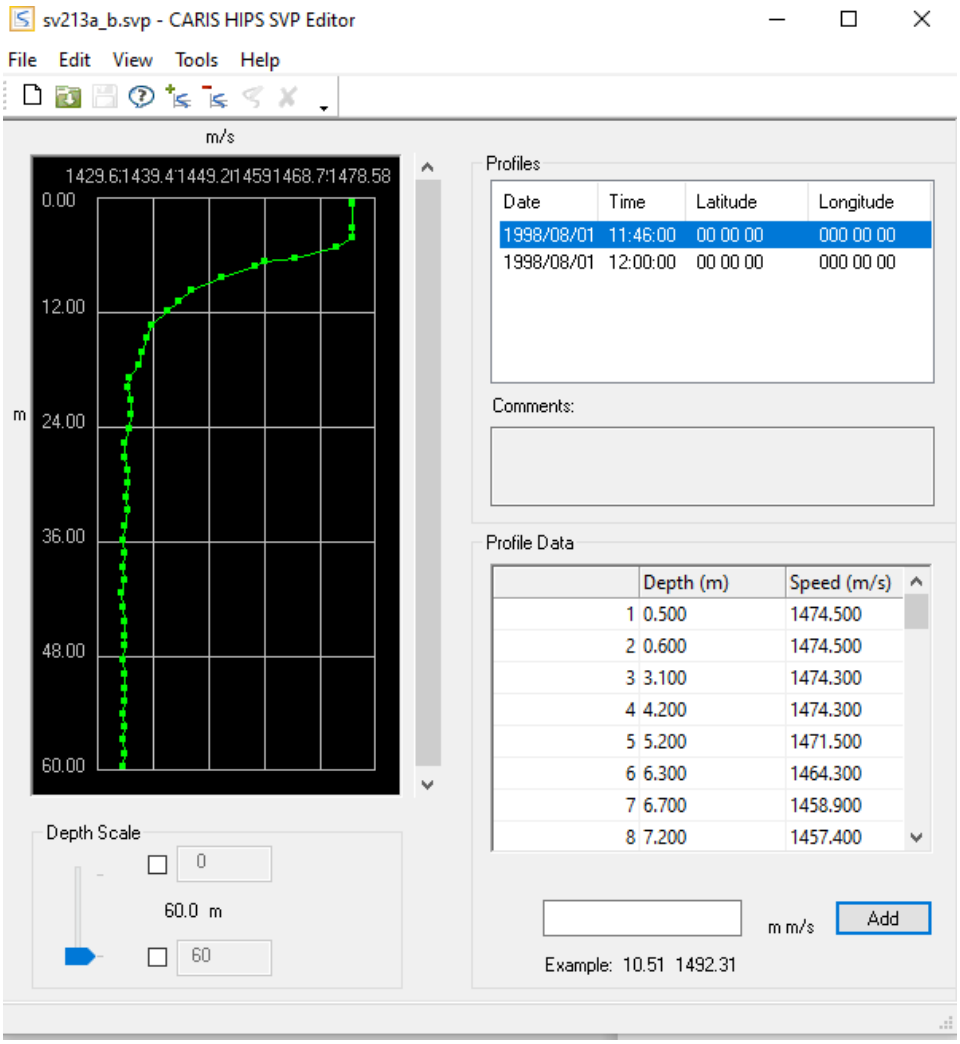


Figure 15: Screenshot of Sound Velocity Profile

Table 2: Depths and Speed at 11:46

Depth (m)	Speed (m/s)
0.5	1474.5
5.2	1471.5
6.7	1458.9

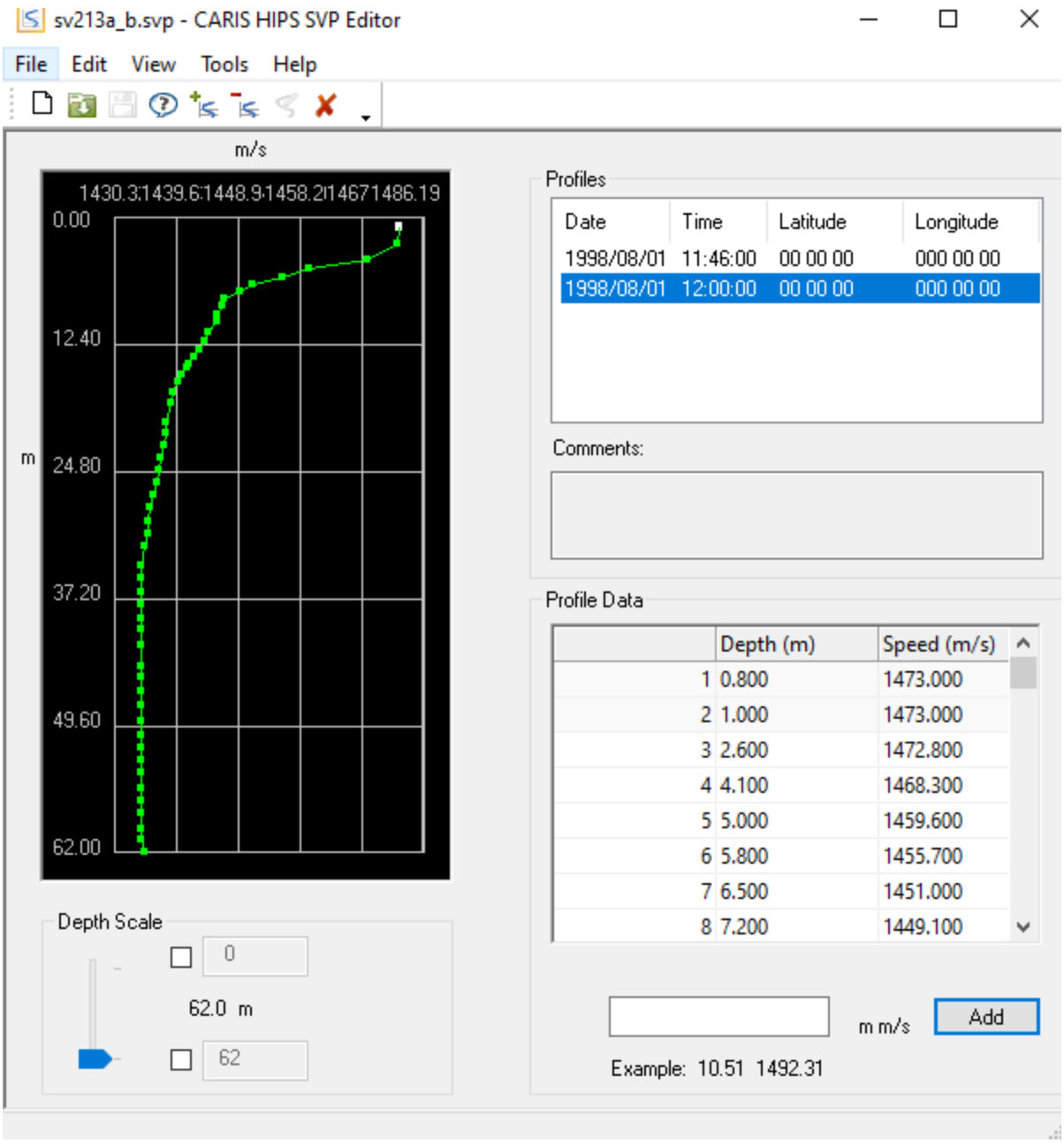


Figure 16: Sound Velocity Profile for 12:00

Time 12:00 doesn't provide the depths.

Deliverable 9

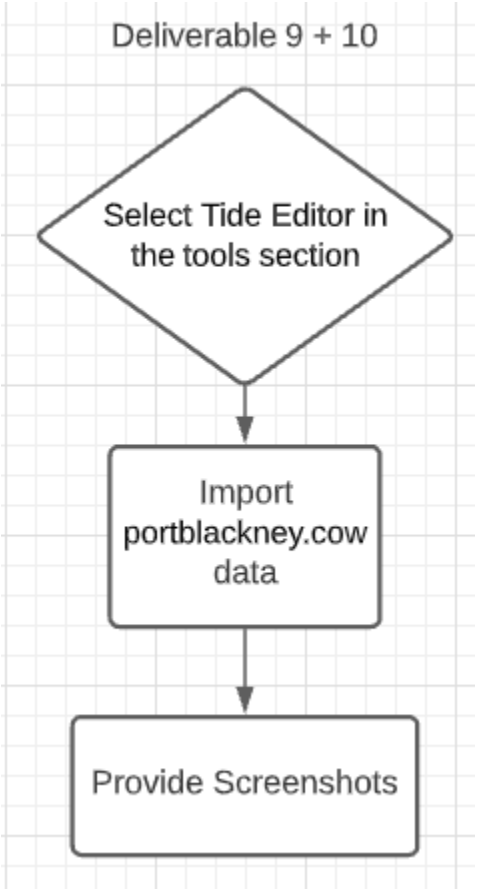


Figure 17: Deliverable 9 Workflow

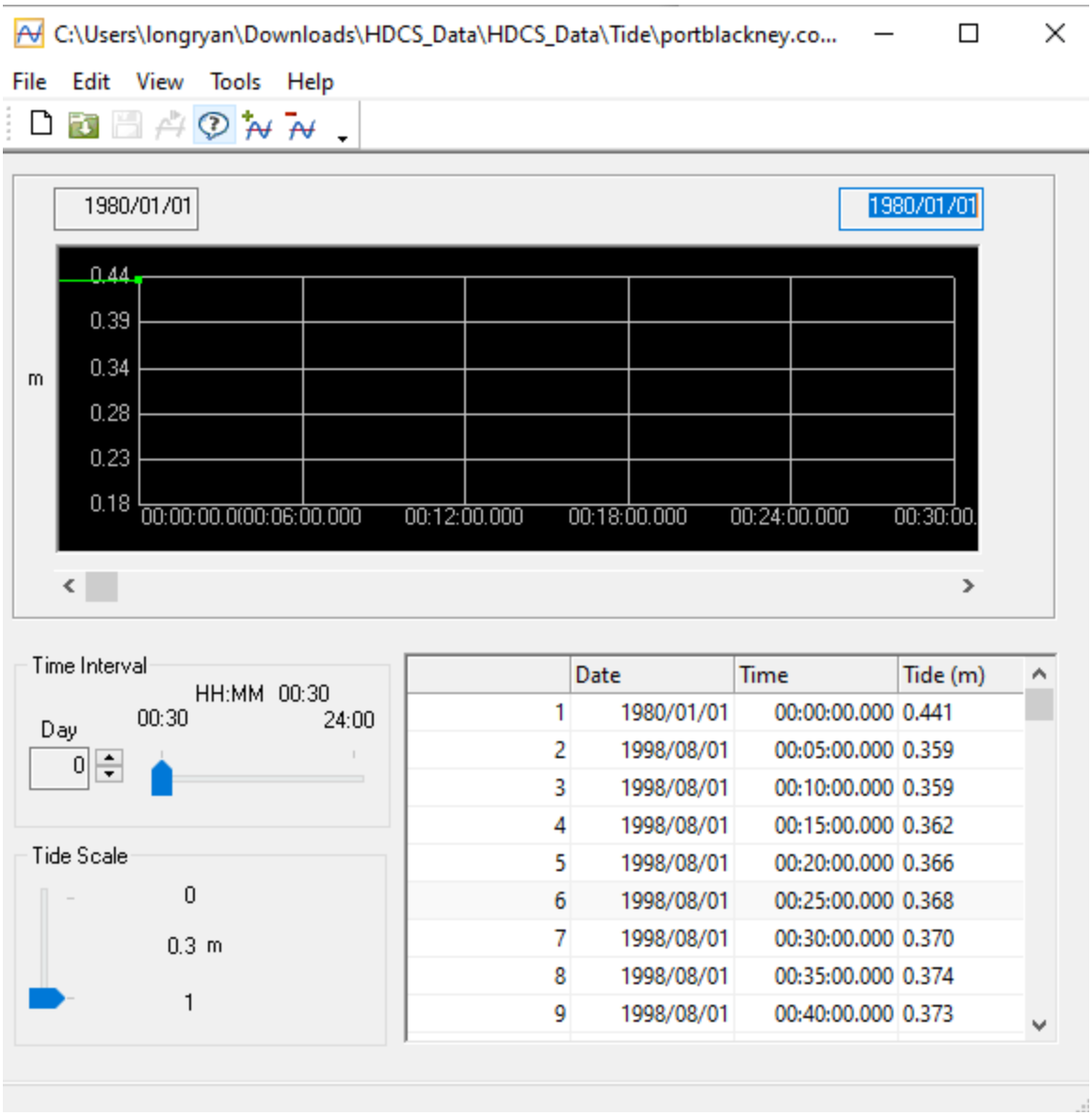


Figure 18: Deliverable 9 Screenshot

Deliverable 10

2 Maximum tied at

	Date	Time	Tide (m)
284	1998/08/01	23:35:00.000	0.440
285	1998/08/01	23:40:00.000	0.441
286	1998/08/01	23:45:00.000	0.444
287	1998/08/01	23:50:00.000	0.442
288	1998/08/01	23:55:00.000	0.445
289	1998/08/02	00:05:00.000	0.359
290	1998/08/02	00:10:00.000	0.359
291	1998/08/02	00:15:00.000	0.362
292	1998/08/02	00:20:00.000	0.366
574	1998/08/02	23:50:00.000	0.442
575	1998/08/02	23:55:00.000	0.445

Figure 19: Maximum Tides

3 minimum tied at

	Date	Time	Tide (m)
121	1998/08/01	10:00:00.000	0.184
122	1998/08/01	10:05:00.000	0.184
123	1998/08/01	10:10:00.000	0.186
124	1998/08/01	10:15:00.000	0.183
125	1998/08/01	10:20:00.000	0.185
126	1998/08/01	10:25:00.000	0.185
127	1998/08/01	10:30:00.000	0.183
128	1998/08/01	10:35:00.000	0.188
129	1998/08/01	10:40:00.000	0.188
413	1998/08/02	10:25:00.000	0.185
414	1998/08/02	10:30:00.000	0.183
415	1998/08/02	10:35:00.000	0.188

Figure 20: Minimum Tides

Deliverable 11

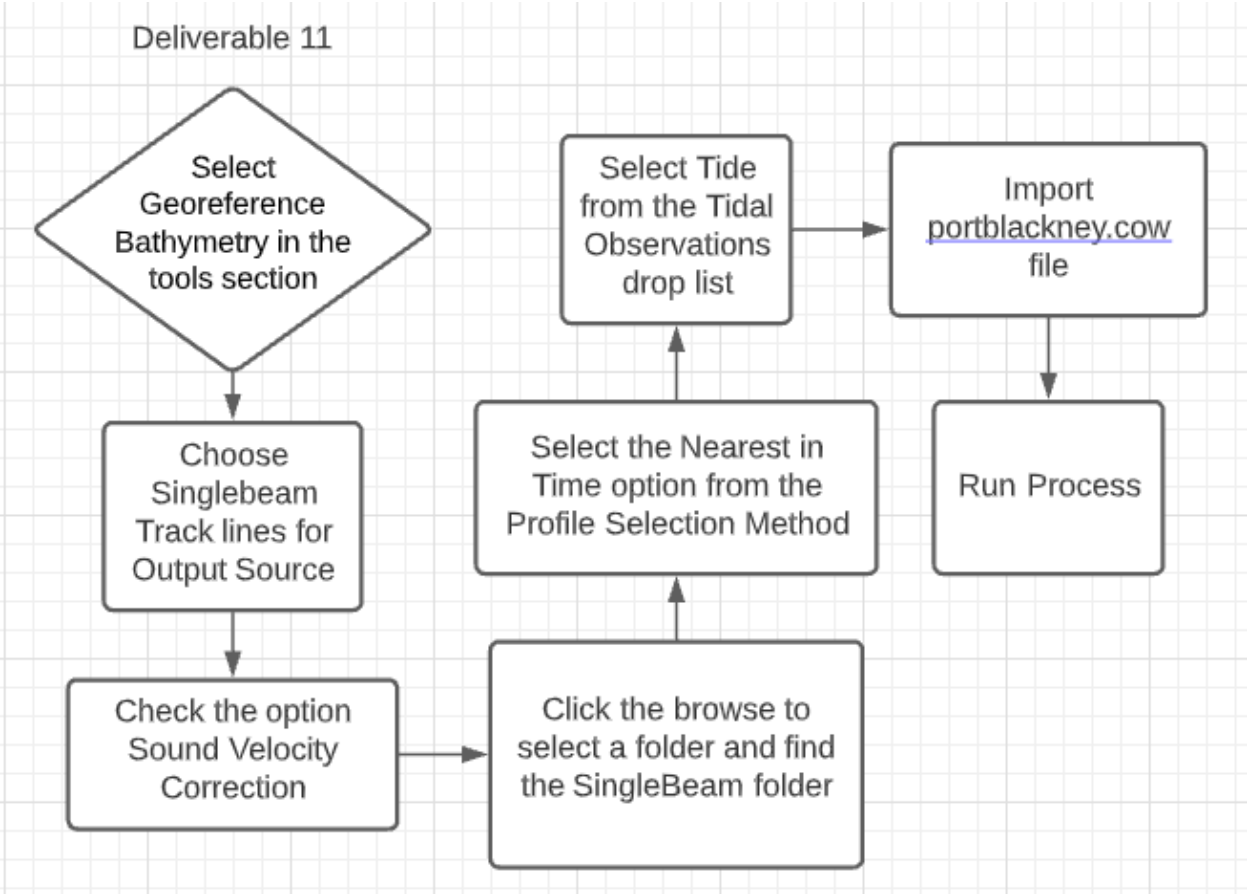


Figure 21: Deliverable 11 Workflow

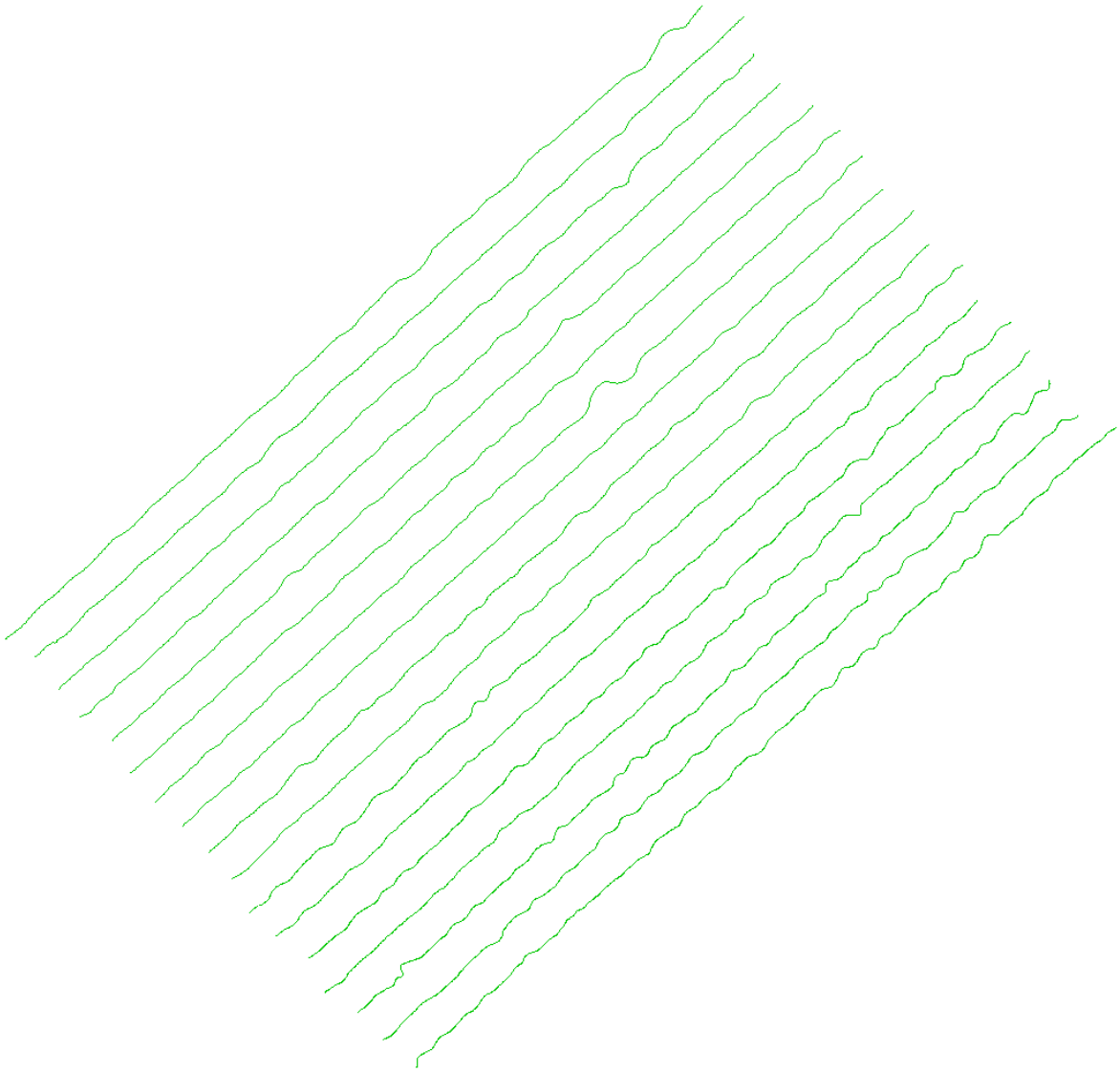


Figure 22: SVP and Tide Corrections Applied to Survey Lines

After the SVP correction, the surface the depth refers to the observed depths and chart datum.

After applying the Tide correction, the depth is relative to the tide stations.

Deliverable 12

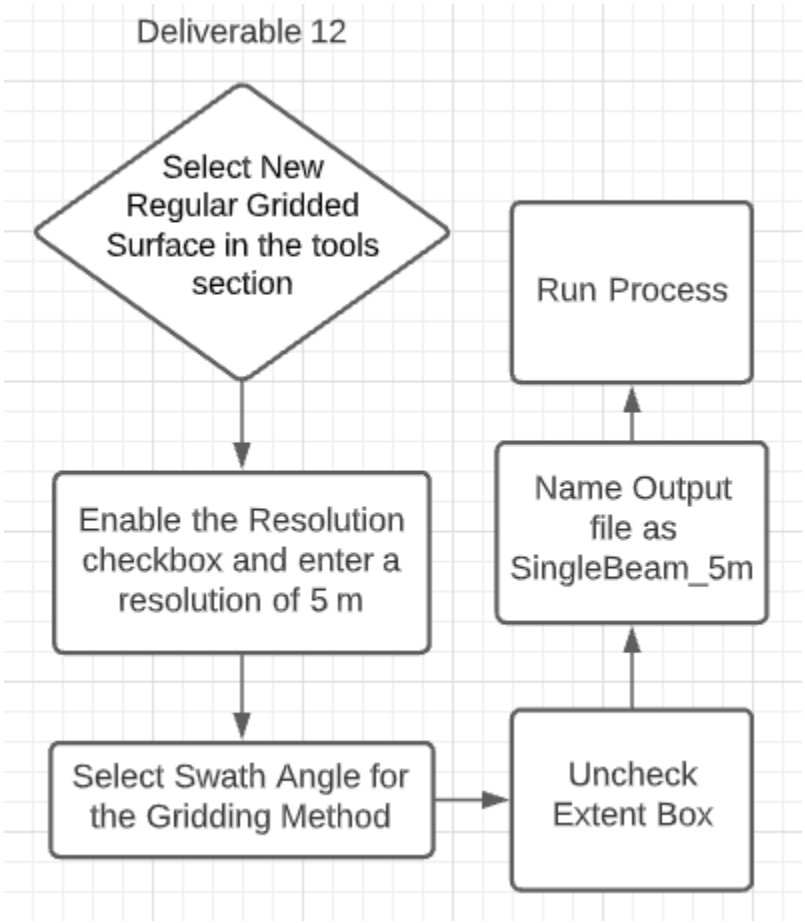


Figure 23: Deliverable 12 Workflow

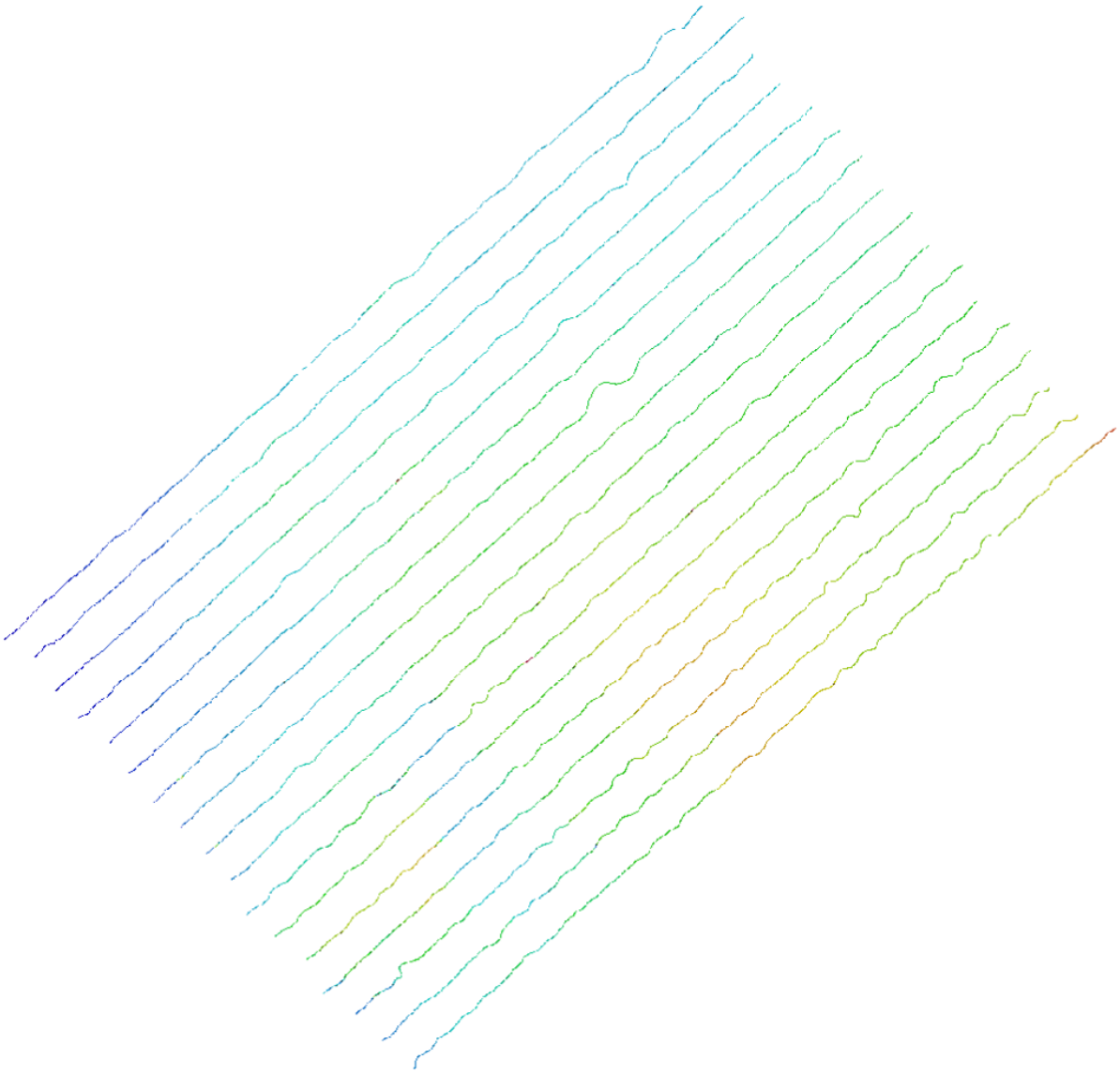


Figure 24: Generated Regular Gridded Surface

Deliverable 13

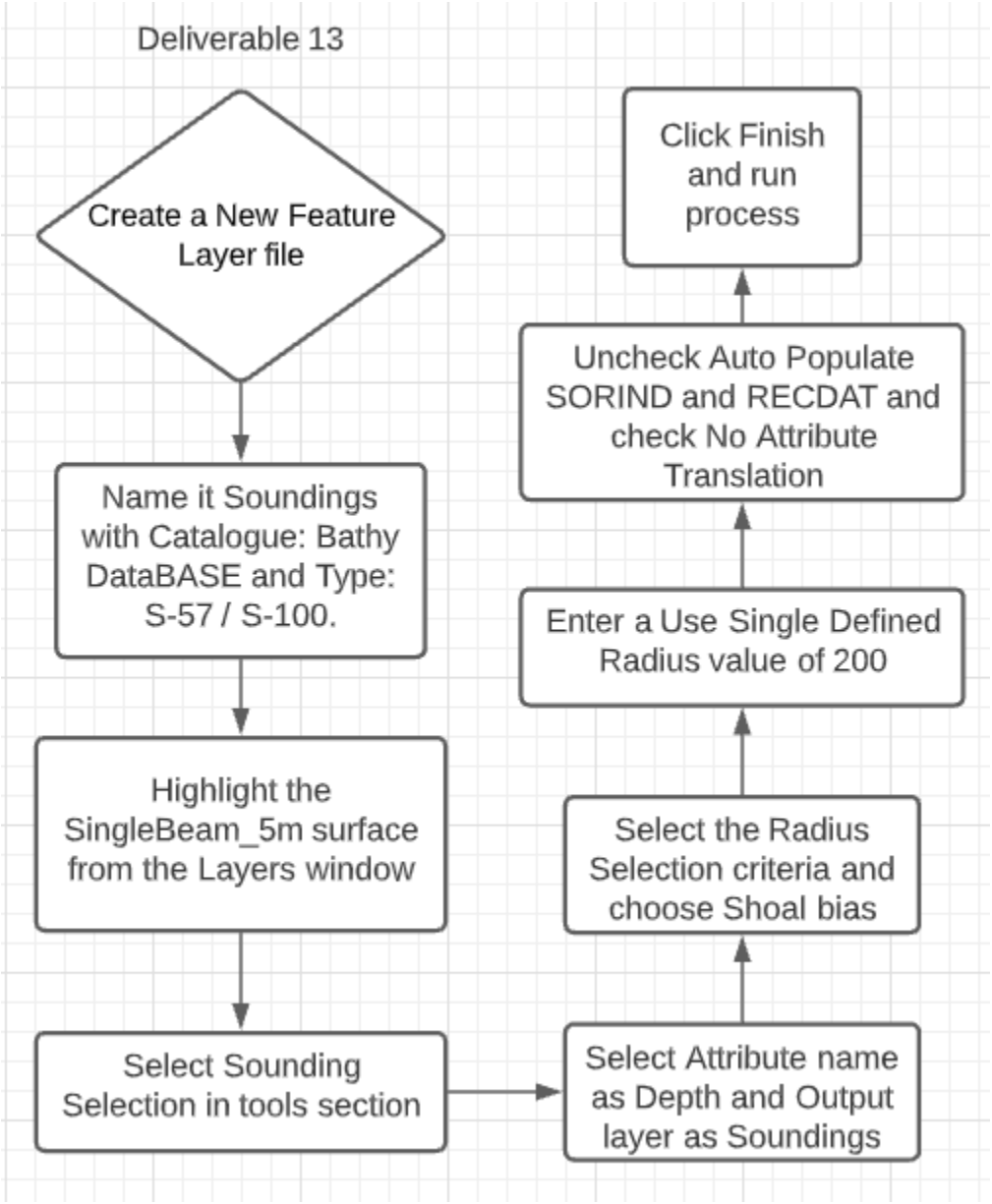


Figure 25: Deliverable 13 Workflow

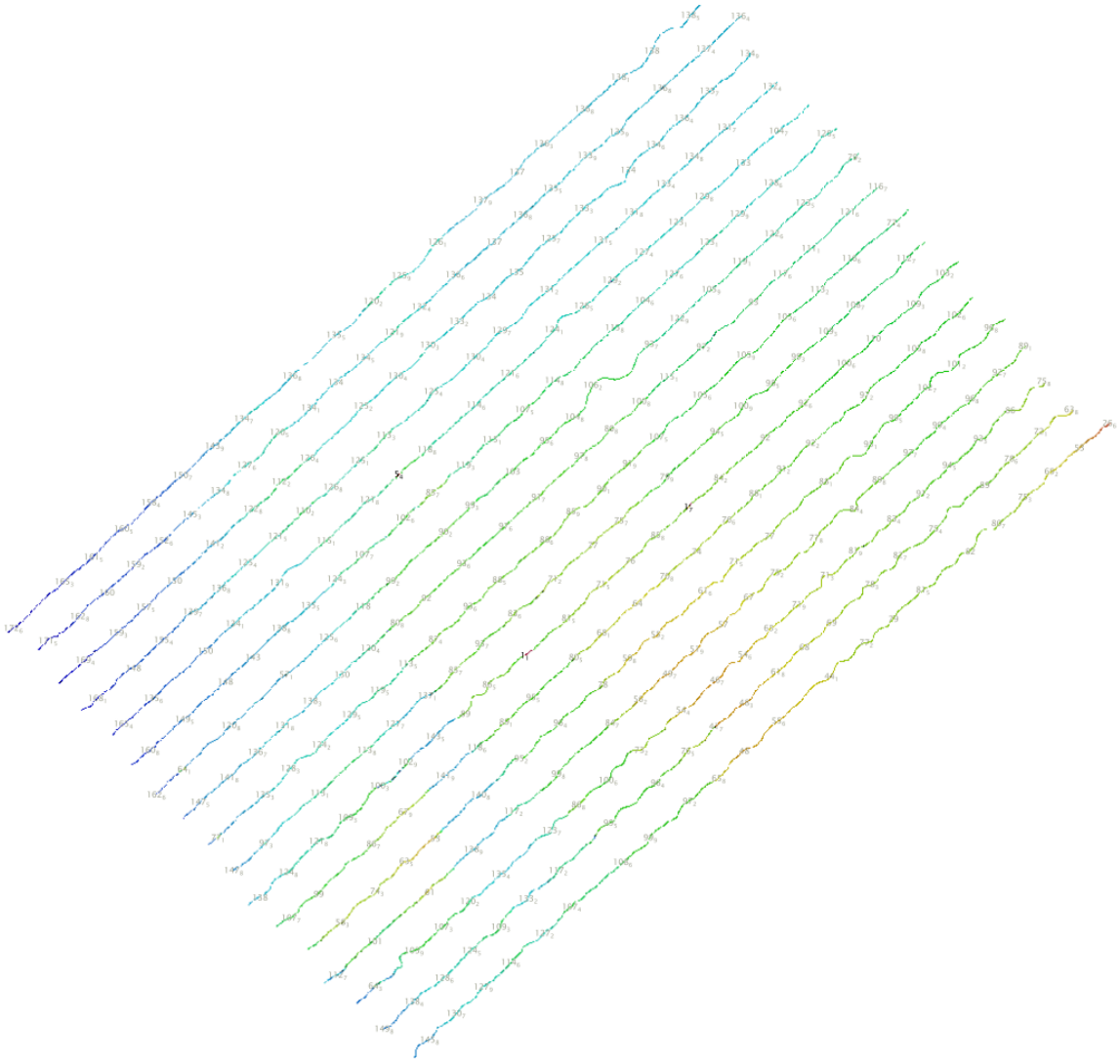


Figure 26: Generated Plot of Selected Soundings

Deliverable 14

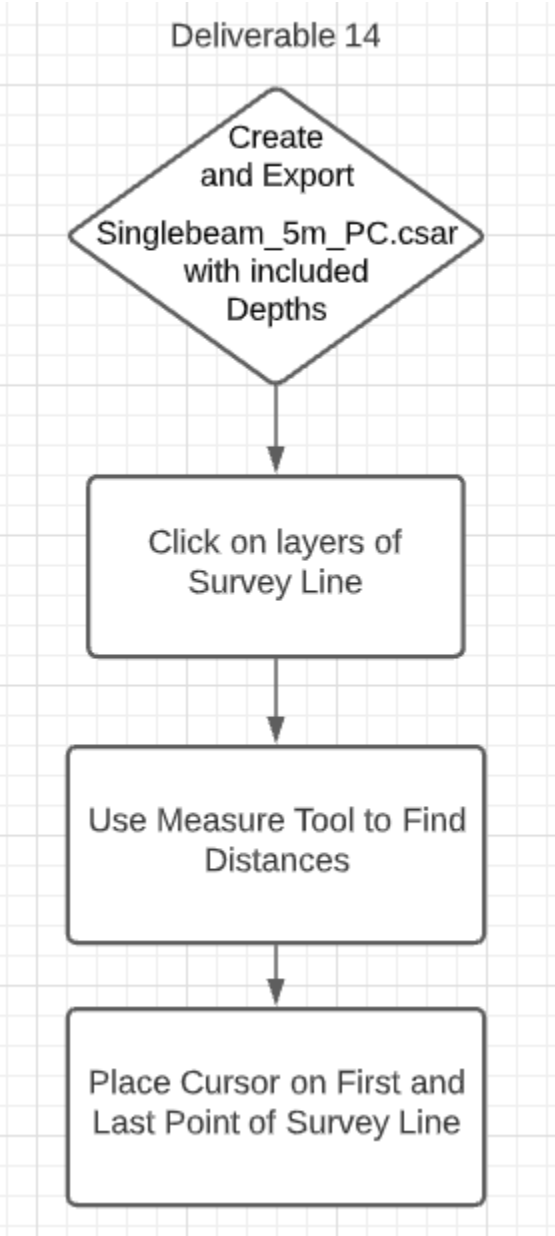


Figure 27: Deliverable 14 Workflow

a) The length of the survey line can be found in the layers list (look at blue line in image)

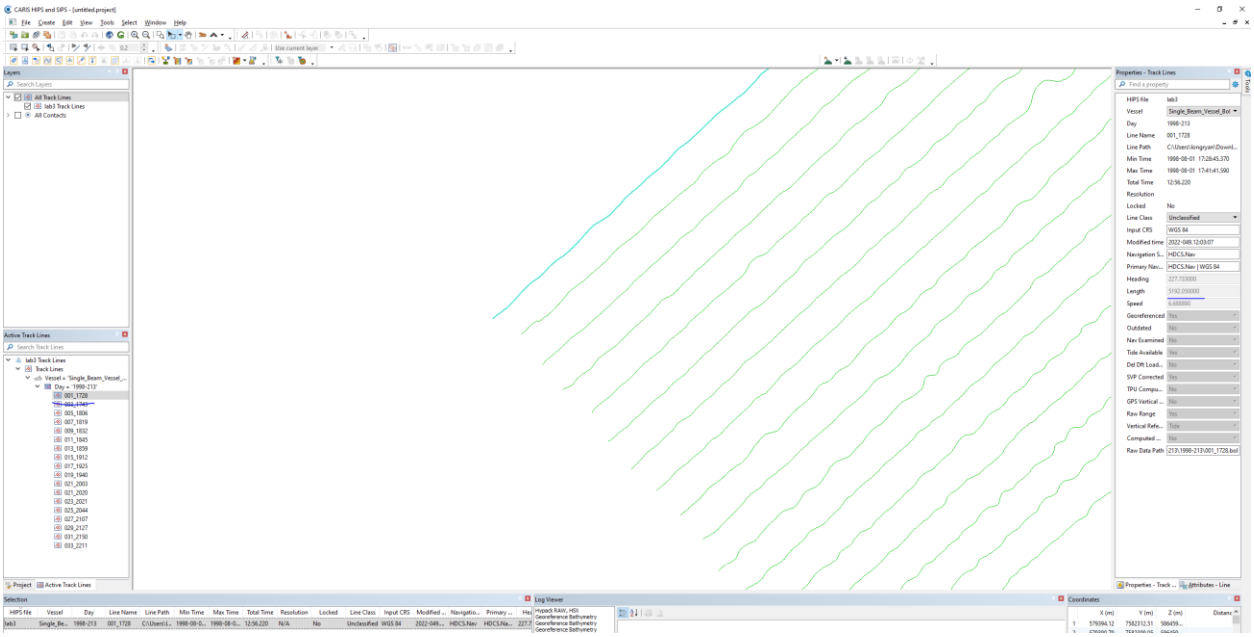


Figure 28: Layer List of Survey Lengths

Note: One survey line is cutoff and continued again, see [Figure 29]. Therefore, it seems that there are 17 survey lines imported. I added this length to the survey line.

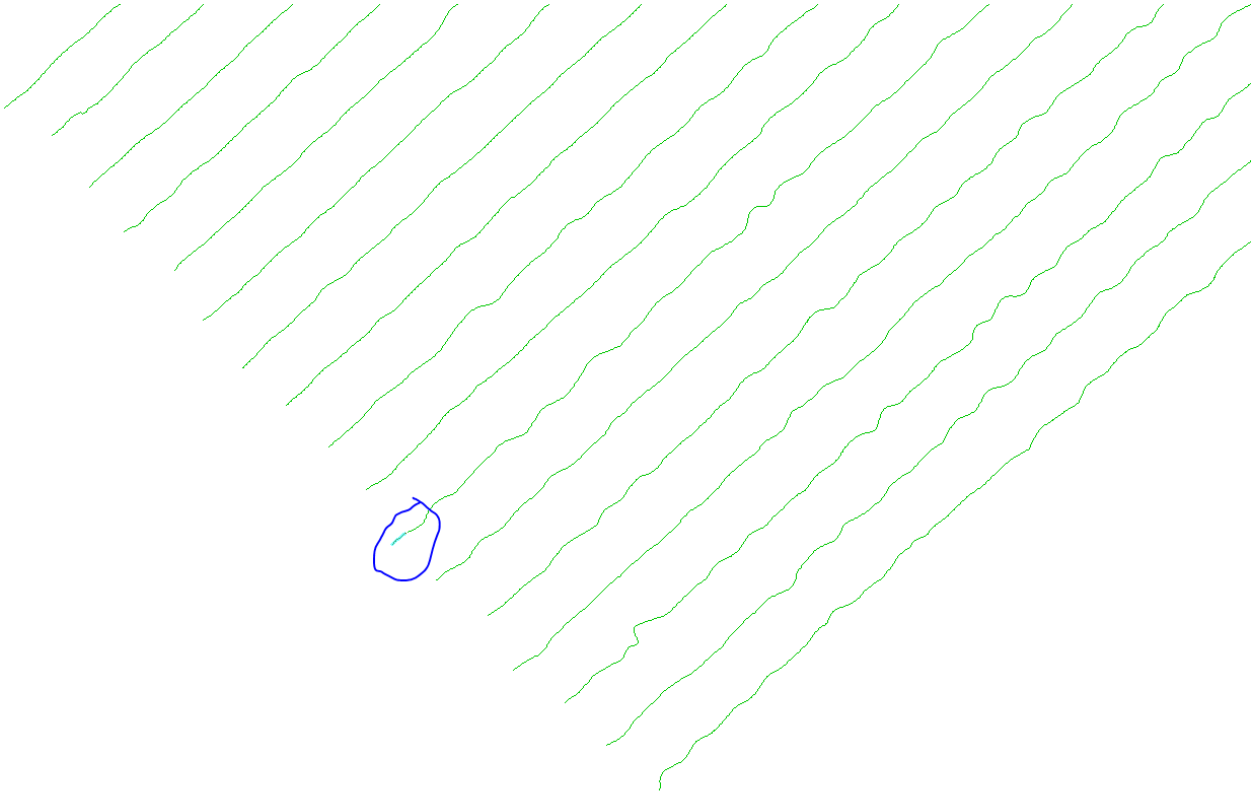


Figure 29: Survey Line Cutoff

Table 3: Lengths of Survey Lines

Survey Line #	Survey Length (m)
1	5192.05
2	5244.14
3	5181.78
4	5172.60
5	5192.13
6	5254.18
7	5303.92
8	5186.61
9	5251.09
10	5183.78
11	5280.55
12*	61.62 + 5214.48
13	5308.01
14	5307.44
15	5343.81
16	5245.74
17	5334.03

The average survey length based off those measurements: 5250.47 m.

b) The Measure Tool found at the toolbox located at the top of the screen was used to find the distances between survey lines. I measured between approximately in the middle of survey lines.

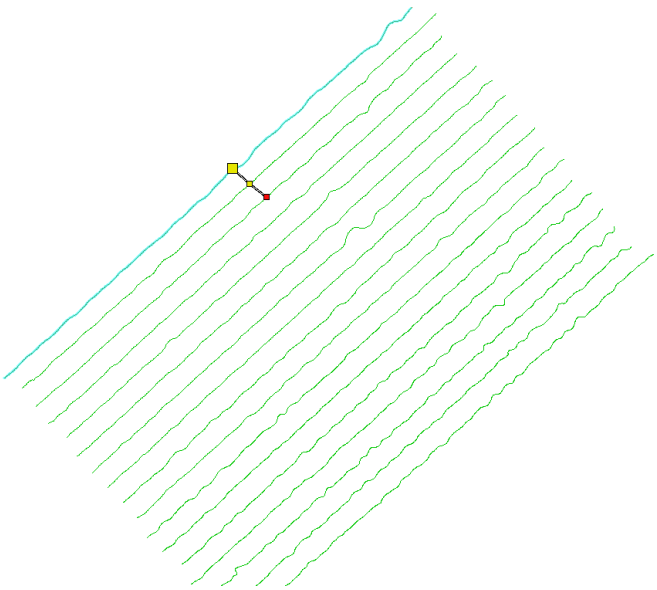


Figure 30: Measurement Tool Between Survey Lines

Table 4: Distances Between Survey Line

Survey Line #	Distances Between Survey Line (m)
1	211.15
2	203.21
3	205.78
4	193.29
5	211.41
6	205.05
7	194.34
8	194.34
9	200.47
10	195.89
11	208.20
12	200.20
13	195.18
14	209.87
15	207.8
16	185.78
17	194.67

The average distance between survey lines based off those measurements: 210.41 m.

c) This is a table of the depths of the first and last point of each survey line:

Table 5: Table of Depths for Survey Lines

Survey Line #	Depth at First Point (m)	Depth at Last Point (m)
1	173.3	139.7
2	171.8	136.4
3	170.8	135.6
4	171.0	133.3
5	166.4	128.8
6	167.5	125.5
7	163.3	120.9
8	167.9	116.7
9	152.9	113.6
10	147.8	111.3
11	139.6	105.0
12	115.8	103.1
13	108.7	95.3
14	133.5	89.1
15	151.4	76.8
16	149.8	63.8
17	147.5	26.6